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(54) Rocker arm for a valve gear of an internal combustion engine

(57) The rocker arm (1) has two limbs (6) which extend in a direction generally parallel to the plane of oscillation of the arm and which are connected together in two regions at two different locations (10, 8) to provide a ball socket bearing (11) therebetween. The arm can be made from a piece of sheet metal strip (2) bent into a U shape, deformation of the limbs (6) in one of the regions allowing a weld (10) to be made between the limbs. A slide contact block (3) and a bolt (4) each connects the two limbs together towards their free end. A valve play compensating element (5) is mounted on the bolt (4). Parallel surfaces (12, 17) engage an extension (14) of a ball pin (13) and the valve stem end (18) respectively to guide the rocker arm (1) along its oscillating path and prevent lateral tilting and twisting movement around the ball pin (13).

FIG. 1

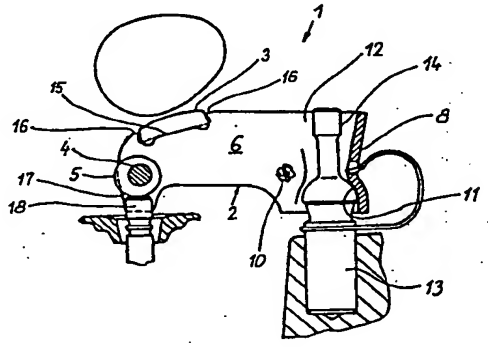

FIG. 2

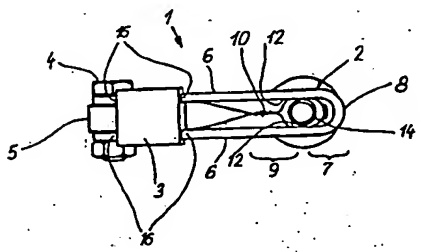

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FIG. 1

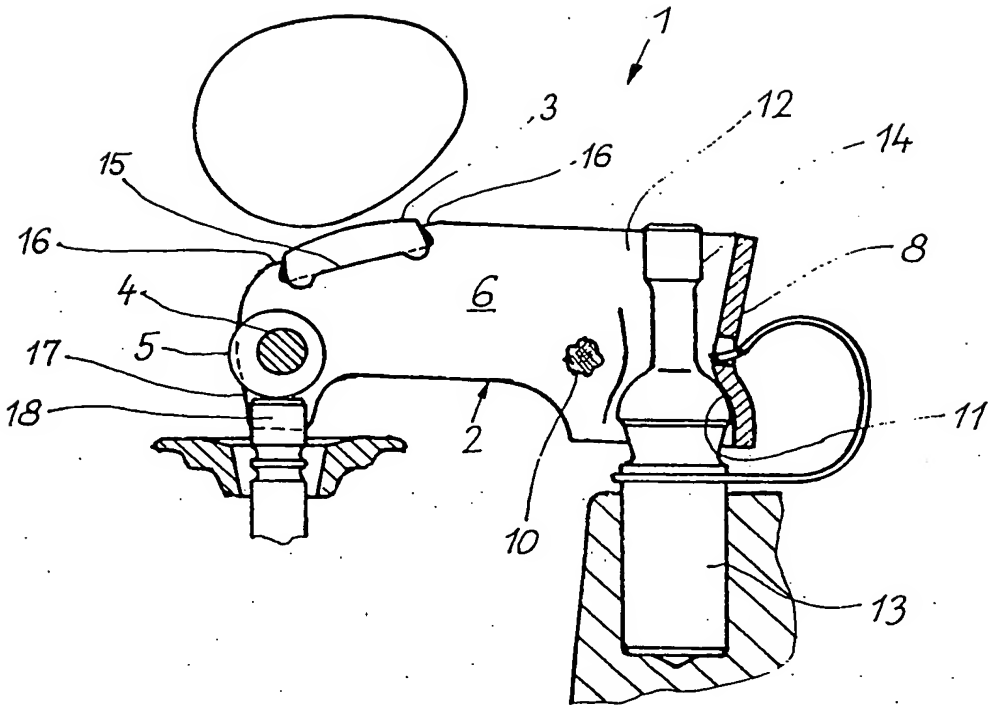
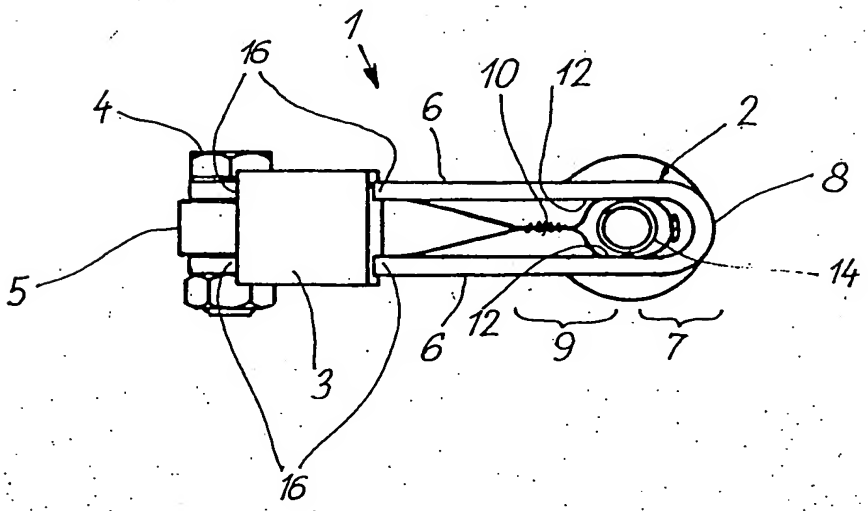


FIG. 2



SPECIFICATION

Rocker arm for a valve gear of an internal combustion engine

The present invention relates to a rocker arm for a valve gear of an internal combustion engine such as incorporated eg in a motor vehicle.

A known rocker arm, having a central mounting about which the arm oscillates, has two limbs which extend side by side in a direction generally parallel to the plane of oscillation. At the end which operates the valve and which has a rolling contact surface the limbs are bent so that they contact one another over a surface area and are welded to one another. A bearing bush is welded between the limbs in the centre of the arm. At the end which co-operates with the camshaft the limbs are connected together by a bolt which supports a roller.

The object of the present invention is to provide a rocker arm having a ball socket bearing with which to mount the arm and about which the arm can oscillate.

According to the present invention there is provided a rocker arm for a valve gear of an internal combustion engine, the rocker arm having two generally planar limbs which extend side-by-side each in a general plane generally parallel to the plane of oscillation of the rocker arm, the limbs being connected together in a first region and being deformed in a second region into abutment and there connected to each other, the second region being near the first, and the two regions of the limbs together forming a ball socket bearing.

The ball socket bearing can either be located intermediate the ends of the rocker arm to provide an arm of the type having a central mounting or at one end of the rocker arm to provide an arm in which contact with a camshaft and with the valve stem occur at the same end, i.e. the end remote from the arm's mounting. In either case the ball socket bearing is provided directly on the rocker arm which can result in an arm which is light, narrow and compact.

Preferably the two limbs are welded together at the location where they abut in the said second region. The two limbs may be formed from a single piece of sheet metal strip bent into a U-shape, the base of the U, which is approximately semi-circular being at one end of the rocker arm and being deformed to provide a portion of the ball socket bearing. The base of the U provides the end of the arm and obviates the need to weld together the ends of the two limbs.

Rocker arms made from metal plates or sheet with formed-on bearing portions are in fact known (German published specification 10 63 425), but these known sheet metal rocker arms have a web or bridge portion tending over their entire length and are more difficult to form, broader, and also heavier than need be the present rocker arm.

The rocker arm preferably includes a slide contact block spaced from the ball socket bearing and securing the two limbs together. The block can thus improve the rigidity of the rocker arm. A valve play compensating element is preferably located between the two limbs and can be mounted on a screw bolt which connects the two limbs together at a position remote from the ball socket bearing. A surface portion of each limb adjacent the ball socket bearing preferably lies in a plane parallel to the plane of oscillation of the rocker arm and serves as a guide surface. When the ball socket bearing is mounted on a ball pin the surface portions can slidably contact an extension of the ball pin in order to guide the rocker arm against lateral twisting and tilting movements and so prevent resultant vibrations with consequent wear and noise.

An embodiment of the present invention will now be described by way of example with reference to the accompanying drawing wherein:-

Figure 1 is a longitudinal section through an end mounted rocker arm and shows the parts of an internal combustion engine which are in engagement with the rocker arm or which act thereon; and

Figure 2 shows a plan view of the rocker shown in Figure 1.

Referring to Figures 1 and 2 the rocker arm 1 includes a sheet metal strip 2 bent to a U-shape and a slide contact block 3 mounted across the arm. A bolt 4 at one end of the rocker arm 1 supports a valve play take-up or compensating element 5.

The U-shaped strip 2 provides two limbs 6 which are each disposed in a plane substantially parallel to the plane of oscillation of the arm and which in a first region 7 are connected directly to one another by means of a bridge part 8 of the strip 2 which is bent into a substantially semi-circular shape. The limbs 6 are deformed locally in a second region 9 near the first region 7 so as to contact one another and are there connected together by a spot weld 10. A lower part (as seen in Figure 1) of the limbs 6 and the bridge part 8 in the area of the two regions 7 and 9 diverge outwardly to form a bearing portion in the shape of a ball joint socket 11. Adjacent the ball socket 11 the internal side surfaces of the limbs 6 (in the upper part of the arm as seen in Figure 1) are parallel to each other and to the plane of oscillation of the arm so as to provide guide surfaces 12. The rocker arm 1 is mounted by means of the ball socket 11 on a ball pin 13 which has a coaxial extension in the form of a guide pin 14. The guide surfaces 12 of the rocker arm 1 co-operate with the guide pin 14.

The slide contact block 3 is at the end of the arm remote from the ball socket 11 and is secured in recesses 15 of the limbs 6. Edge portions 16 of the recesses 15 are cold worked to clamp the block 3 in place so that it connects the limbs 6 together. The slide contact block 3 can alternatively be fixed to the limbs 6 by soldering or by a combination of soldering and cold working of edge portions of the recesses.

The element 5 for taking up or compensating for valve play is formed as an eccentric and is mounted on the bolt 4 which connects together the free ends of the limbs 6. The element 5 is clamped fast between the limbs 6 in a position to which it has been adjusted by turning. The limbs 6 extend beyond both sides of the element 5 and constitute guide lugs 17 which engage a cylindrical valve stem

end 18 of the valve and guide the rocker arm 1 so as to counteract its tendency to turn on the ball pin 13.

Since it is formed from a simple sheet metal strip 2, the rocker arm 1 can be very light in weight. In addition the ball socket 11 is easier to form than would be the case if the rocker arm were a trough-shaped sheet metal pressing. The guide pin 14 formed as a coaxial extension of the ball pin 13 provides, in conjunction with the parallel guide surfaces 12, a simple and effective means for guiding the rocker arm 1 and preventing lateral tilting of the arm and accompanying noise and wear, which can occur when rotation of the cam allows play in the valve gear. Noise reduction is of particular importance in the case of motor vehicles.

CLAIMS

1. A rocker arm for a valve gear of an internal combustion engine, the rocker arm having two generally planar limbs which extend side-by-side each in a general plane generally parallel to the plane of oscillation of the rocker arm, the limbs being connected together in a first region and being deformed in a second region into abutment and there connected to each other, the second region being near the first, and the two regions of the limbs together forming a ball socket bearing.

2. A rocker arm according to claim 1 wherein the two limbs are welded together at the location where they abut in the said second region.

3. A rocker arm according to claim 1 or claim 2 wherein the two limbs are formed from a single piece of sheet metal strip bent into a U shape, the base of the U, which is approximately semi-circular being at one end of the rocker arm and being deformed to provide a portion of the ball socket bearing.

4. A rocker arm according to any one of the preceding claims including a slide contact block spaced from the ball socket bearing and securing the two limbs together.

5. A rocker arm according to claim 4 wherein the slide contact block is secured in recesses in the two limbs, edge portions of the recesses being shaped by cold deformation to clamp the block.

6. A rocker arm according to any one of the preceding claims including a valve play compensating element located between the two limbs remote from the ball socket bearing.

7. A rocker arm according to claim 6 including a screw bolt remote from the ball socket bearing and connecting together the two limbs, the valve play compensating element being mounted on the screw bolt.

8. A rocker arm according to any one of the preceding claims wherein a surface portion of each limb adjacent the ball socket bearing lies in a plane parallel to the plane of oscillation of the rocker arm and serves as a guide surface.

9. A rocker arm according to claim 8 wherein the ball socket bearing is mounted on a ball pin and the said guide surfaces slidably contact an extension of the ball pin in order to guide the rocker arm.

10. A rocker arm according to claim 9 wherein the extension is co-axial with the ball pin.

11. A rocker arm substantially as shown in and hereinbefore described with reference to Figures 1 and 2 of the accompanying drawing.

12. An internal combustion engine having rocker arms according to any one of the preceding claims forming part of its valve gear.

13. A motor vehicle incorporating an internal combustion engine according to claim 12.

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